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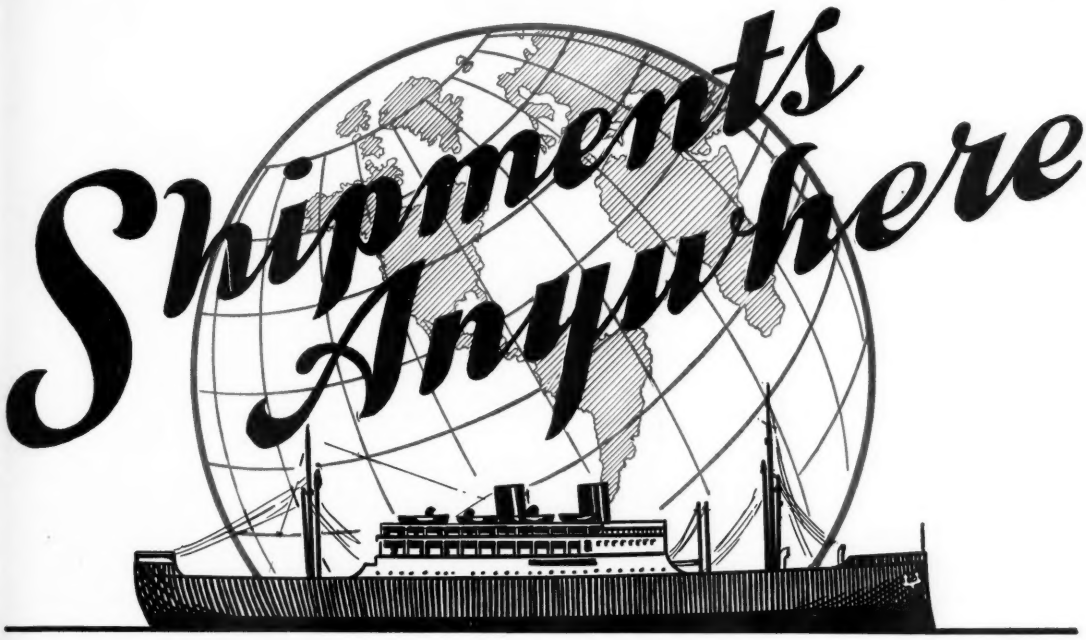

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30-Year Fruit Fertilizer Facts*

By FRED W. HOFMANN

Virginia Agricultural Experiment Station

APPLICATION of fertilizers to apple trees for the most profit has always remained a perplexing problem to Virginia growers. With the great variety of reports on responses to fertilizer treatments and every orchard in itself a special problem for fertilizer solution, it is no wonder that so much confusion prevails.

There are instances in Virginia where fruit can be grown profitably, quoting Hedrick of New York, "Without a single ounce of fertilizer." Years of observations based upon much experimental evidence show, however, that more profitable returns are secured from applications of some form of nitrogen and in some instances from a combination of nitrogen with either phosphorus or potash or both.

After all, the best procedure is to go to the fruit trees themselves with certain questions for the clearer and more direct answers. Let us ask some questions of trees that have been the highest yielders among their general group over a period of some 30 years. Let us ask them what was the initial soil fertility at the time of planting, what were the fertilizer treatments during this 30-year period and how did the respective treatments show up in yield responses?

Five of the highest yielding York Imperial, five of Stayman and five of Winesap apple trees were selected for this quiz. These are growing in the orchard of the Virginia Agricultural Experiment Station just out of Blacksburg. At this writing the trees are 30 years of age.

The soil of this orchard, which closely resembles the Hagerstown series and has been until recently classified as such, belongs to the Dunsmore series. The Hagerstown series includes the large orchards of the Shenandoah Valley as well as the "apple pie ridge." The Cecil takes in those generally south and southeast of the Blue Ridge Mountain section of Virginia.

Although a difference in the chemical content exists between these three as well as some of the others of Virginia, for general practical purposes in this discussion the results secured from those of the Dunsmore should apply rather satisfactorily to all. The Dunsmore series will indicate a fair cross section of the nitrogen, phosphorus and potassium content in an average Virginia orchard soil.

According to a HCl (specific gravity 1.115) method there is present in soils of the Dunsmore series .06 per cent phosphoric acid and .545 potash. This would indicate an availability of 2,100 pounds of phosphoric acid and 19,075 pounds of potash to the foot acre. If all of this material is available to apple trees, there would be enough phosphoric acid to take care of the needs of 40 apple trees capable of producing 20 bushels of apples annually per tree for 191 years and enough potash for 439 years. These soils also show about .09 per cent nitrogen to be available or 3,150 pounds per foot acre. This would provide enough nitrogen for 40 such apple trees over some 78 years.

Analyses of the Cecil series do not show such high amounts of phosphoric acid and potash. These are as follows based on HCl test: for phosphoric acid .03 per cent and for potash .17. Nitrogen shows a content of .11 per cent. According to these percentages there should be available 3,850 pounds of nitrogen, 1,050 pounds of phosphoric acid and 6,358 pounds of potash. The amount of nitrogen available should take care of the 40 apple trees mentioned for 98 years, the phosphoric acid for 96 years and the potash for 150 years.

* Reprinted from "American Fruit Grower," April, 1940.

Using the more rigid test for availability, namely, the fifth normal nitric solution, less phosphoric acid and potash would be available for apple trees. In the Dunsmore series there are shown to be present on this basis of analysis 53 parts per million or 185 pounds of phosphoric acid and 325 parts per million or 1,116 pounds of potash per foot acre. The Cecil soil series shows 23 parts per million or 81 pounds of phosphoric acid and 295 parts per million or 1,033 pounds of potash per foot acre.

The 40 apple trees according to these indications of availability in the Dunsmore series would be supplied with enough phosphoric acid for some 17 years and with potash for 25 years. In the Cecil series the phosphoric acid available would meet the needs of the 40 apple trees for eight years and potash for 24 years.

Accepting the more rigid test for availability, the two more common apple sections of Virginia show that on an average an acre has enough of the three essential elements to take care of 40 apple trees, each yielding a crop of 20 bushels annually, on the following basis: for nitrogen between 75 to 98 years, for phosphoric acid between 10 to 17 years and for potash between 23 to 25 years.

How do these tests bear out in experimental observations and how are certain responses of apple trees to different fertilizer application involving these three essential elements to be reconciled on the basis of these soil tests for availability?

Table I

Yield Responses of Five Highest Performers

YORKS

Year	NK** II-4-19 Yield* Lbs.	NP II-6-14 Yield Lbs.	NP I-3-19 Yield Lbs.	C*** II-5-20 Yield Lbs.	N I-2-14 Yield Lbs.
1918	0	2	2	0	1
1919	0	0	0	0	0
1922	0	87	150	48	5
1923	148	58	192	168	97
1924	525	650	750	750	700
1925	50	0	0	50	0
1926	950	750	300	430	400
1927	50	0	0	50	0
1928	600	750	275	700	690
1929	1,050	1,250	1,600	400	1,250
1930	620	1,100	60	1,100	600
1931	1,200	800	1,150	800	1,150
1932	200	1,000	0	525	250
1933	1,125	850	1,300	850	1,000
1934	200	550	50	700	100
1935	1,900	600	1,850	1,100	1,250
1936	50	150	0	100	50
1937	1,550	1,000	1,400	1,300	1,400
1938	....	....	....	....	....
1939	....	....	....	....	....
Total	10,218	9,597	9,079	9,071	8,943

STAYMAN

Year	NK II-7-2 Yield* Lbs.	NP I-3-1 Yield Lbs.	N I-2-3 Yield Lbs.	N II-2-1 Yield Lbs.	NPK I-8-9 Yield Lbs.
1918	2	24	7	0	3
1919	0	0	0	0	0
1922	43	0	6	8	0
1923	84	388	336	25	144
1924	800	365	700	100	500
1925	300	700	500	250	400
1926	800	500	500	900	400
1927	0	150	30	0	0
1928	900	450	900	400	800
1929	1,250	550	600	950	700
1930	850	1,000	1,020	1,250	900
1931	950	100	300	1,100	600
1932	1,500	1,550	1,150	600	1,700
1933	100	50	0	100	0
1934	1,450	1,550	1,100	1,200	1,200
1935	350	950	900	1,000	1,200
1936	1,250	725	100	650	800
1937	0	1,350	1,650	1,200	275
1938	625	765	500	575	1,000
1939	600	825	1,500	550	325
Total	11,854	11,902	11,799	10,859	10,047

WINESAP

Year	NK I-7-1 Yield* Lbs.	N I-2-2 Yield Lbs.	N I-2-1 Yield Lbs.	NPK III-7-8 Yield Lbs.	NP I-6-7 Yield Lbs.
1918	1	1	1	0	3
1919	0	0	0	0	0
1922	0	0	0	21	0
1923	64	90	56	108	11
1924	225	200	200	300	90
1925	550	0	0	500	300
1926	400	350	300	350	300
1927	0	30	30	50	0
1928	350	340	350	290	550
1929	750	700	450	400	300
1930	700	650	450	400	760
1931	600	500	550	700	700
1932	750	575	1,100	450	750
1933	250	100	100	25	150
1934	1,400	500	1,100	1,100	1,175
1935	1,250	1,850	1,900	1,350	950
1936	800	750	450	525	700
1937	800	1,050	600	1,000	400
1938	375	150	300	125	750
1939	400	925	1,000	875	275
Total	9,665	8,761	8,937	8,569	8,164

* Ranked in order of yield from left to right.

** Fertilizer treatments—N Nitrogenous, P Phosphatic and K Potassic.

*** No fertilizer applied except nitrogen from 1934 to 1937 inclusive.

Fertilization in all cases was withheld after 1937.

Let us go to the records of the five highest yielding Yorks, Staymans and Winesaps at the Virginia Agricultural Experiment Station to ascertain what bearing the initial soil fertility, the situation regarding soil moisture retention and the fertilizer applications may have had on the yield responses of each of these trees. Let us refer to Table I.

These trees selected from the fertilizer experimental plots of the Virginia station were set out in the spring of 1911 and were given their respective fertilizer treatments from 1912 to 1937 with the exceptions that are to be indicated. Applications were made to compare the effects of nitrogen alone and combinations of nitrogen with either or both phosphorus and potassium. The nitrogen in combination was used on the same basis as by itself. The initial basis per tree was 5.9 ounces of sodium nitrate with 8.3 ounces of blood meal for the nitrogen, 29.6 ounces of 16 per cent acid phosphate for the phosphorus and 5.9 ounces of potassium sulphate for the potassium. By 1928 these were stepped up to 24 ounces of sodium nitrate with 36 ounces of blood meal, 82 ounces of 16 per cent acid phosphate and 24 ounces of potassium sulphate. From then on the basis per tree was five pounds of sodium nitrate, two pounds of 16 per cent acid phosphate and one pound of potassium sulphate.

Differences in Location

The general site of the entire experimental orchard was the most uniform that could be secured in the general vicinity. Nevertheless, very significant differences prevail throughout. Some spots were far more favored than others in initial fertility and soil moisture retention. Ranked in their order of the more favorable situation to start with, the five York trees were as follows: First C*** (II-5-20) where no fertilizer was used until 1934 when a five-pound application of sodium nitrate was made and each year after that until 1937 inclusive; second N (I-2-14) where the nitrogenous material only was used; third NK (II-4-19) where sulphate of potash was used along with the nitrogenous materials; fourth NP (II-6-14) and fifth NP (I-3-19) where 16 per cent acid phosphate was used with the nitrogenous materials.

Although the check tree C (II-5-20) had the more favored situation to start with as compared to the other trees in this group of five, it was outyielded by those that were treated with nitrogen and potash. This check tree came third in yield after 1937. This is attributed to the N it received after 1934.

The trees receiving the combination fertilizers also outyielded the one that received only nitrogen even though they were in much more unfavorable situations regarding initial soil fertility.

Taking all these factors into consideration, it would appear that the more favorable responses developed in the trees receiving the combinations indicated. Adding 10,218, 9,597, 9,079 to make 28,894 and dividing by three to give 9,631 pounds, the average for the yields of the combination fertilizer trees, there is, then, after subtracting the yield of the check tree 9,071, a gain of 560 pounds or about 11 bushels of fruit in favor of the combination set.

With the total cost for the fertilizers used over the entire time at $2,65, it is left up to anyone who wishes to figure any further whether or not the risk of the added expense for the fertilizer used was worth while. The difference between this combination fertilizer yield average and that of the tree receiving nitrogen alone was 688 pounds or about 13 bushels gain for the combination set at a risk of $1.15.

In the Stayman group the order of best initial situation was as follows: First N (I-2-3) and second N (II-2-3) where only nitrogenous material was used; third NK (II-7-2) where potassium sulphate was added to the nitrogenous materials; fourth NP (I-3-7) where 16 per cent acid phosphate was added to nitrogenous materials; fifth NP (I-8-9) where both 16 per cent acid phosphate and potassium sulphate were added to the nitrogenous materials.

Compared to the two trees receiving only the nitrogenous materials, all of the other trees were decidedly handicapped to start with, yet the NK and NP gave the higher yields.

Complete Fertilizer Needed

In the Stayman group of the five highest yielding trees the rank in order of the more favorable soil situation to start with is as follows: First N (I-2-3) and second N (II-2-3) trees treated only wth nitrogen; third NK (II-7-2) where sulphate of potash was added to the nitrogenous materials; fourth NP (I-3-1) where acid phosphate was added to the nitrogenous fertilizers; fifth NPK (I-8-9) where both acid phosphate and sulphate of potash were applied along with the nitrogenous sources.

The trees in this group receiving only the nitrogenous fertilizers were by far in the better soil situations to start with, yet they were outyielded by those receiving NK and NP combinations. The tree receiving NPK is in a badly galled and eroded slope and at a very decided disadvantage. Compared with trees in far better situations receiving no fertilizers, it outyielded the far more favored highest yield check tree by over 2,100 pounds or over some 40 bushels from 1918 to 1939, inclusive. The gain of this NPK tree over similarly situated trees receiving nitrogen only was approximately 30 bushels.

In the Winesap group the order in rank for the initial situation was first N (I-2-2) and

second N (I-2-1) receiving nitrogenous material only; third NK (I-7-1) receiving potassium sulphate and nitrogenous materials; fourth NP (I-6-7) receiving 16 per cent acid phosphate and nitrogen; and fifth NPK (III-7-8) receiving both 16 per cent acid phosphate and potassium sulphate along with the nitrogenous materials. The NPK tree was in heavy sod up to 1930 and generally greatly handicapped compared to the other top-notch yielders.

The yield of the highest Winesap check tree for this entire period was only 2,255 pounds or some 45 bushels. The lowest yielding Winesap in this five high yielding group was 8,164, a gain of some 6,909 pounds or about 138 bushels over the highest check.

It would appear that most of our Virginia orchard soils contain nitrogenous, phosphatic and potassic material in adequate amounts to take care of apple trees through their entire commercial life. In some instances fruit may be grown more profitably with no fertilization whatever or at most only with occasional nitrogenous applications. The point that may be overlooked is that in most Virginia apple orchards these materials become increasingly inaccessible as the root systems of the apple trees develop and displace soil in a limited space. Apple trees reaching a physiological limit may draw upon their reserves to such a degree that they are liable to become susceptible to various stages of decline.

At any rate the evidence produced from the results of experiments conducted over a three-year period in a closely planted orchard from its twentieth to twenty-third year indicate in a striking manner the direct responses of apple trees to fertilizers under such conditions. See Table II. The soil in this orchard, which is described as a Clarksville gravelly silt loam, is very cherty and shows a pH reading of about six. The subsoil, composed mostly of a tight, stiff clay, is seldom penetrated to a depth of more than two feet. At the time of the experiment the trees were low in vigor as well as yields and small for their age as compared to other trees planted in the same year in this general vicinity. These trees are planted 25 feet apart which no doubt in a large measure checked growth.

The treatments were as listed in Table II.

Rows 13 to 19, inclusive, except the check rows, were all on the same nitrogen basis. It

(Continued on page 26)

Table II

Average Annual Yield Picked Fruit Twentieth to Thirtieth Year, Inclusive
Dean Price Orchard

Row	Bushels per tree: Grimes	York	Stayman	All Varieties	Treatment
1	1.23	1.07	1.65	1.32	Calcium Cyanamide 5 lbs. Fall
2	2.43	1.39	1.27	1.65	Calcium Cyanamide 10 lbs. Fall
3	1.74	.89	1.14	1.25	Check*
4	2.79	1.74	2.28	2.27	Sulphate of Ammonia 5 lbs. Fall
5	1.91	1.32	1.25	1.49	Nitrate of Soda 6.5 lbs. Fall
6	1.36	1.19	1.38	1.31	Calcium Cyanamide 5 lbs. Spring
7	.89	1.18	.33	.80	Check
8	1.45	1.35	1.55	1.45	Calcium Cyanamide 10 lbs. Spring
9	1.80	1.23	.62	1.22	Calcium Cyanamide 15 lbs. Spring
10	.70	1.19	.30	.73	Check
11	1.09	1.59	1.41	1.37	Sulphate of Ammonia 5 lbs. Spring
12	1.19	.44	.39	.67	Check
13	5.31	2.91	1.75	3.32	Ammo-Phos. 13 lbs. Spring
14	3.66	3.07	2.71	3.15	Ammo-Phos. Pot. 17½ lbs. Spring
15	1.19	1.39	.62	1.07	Check
					FALL APPLICATION:
16	3.75	2.75	4.00	3.50	Calcium Cyanamide 10 lbs. Acid Phos. (20%) 13 lbs., Sulphate of Potash 4.2 lbs.
17	4.13	2.07	2.69	2.96	Calcium Cyanamide 10 lbs. Sul. Potash 4.2 lbs.
18	4.44	2.63	2.44	3.17	Calcium Cyanamide 10 lbs. Acid Phos. (20%) 13 lbs.
19	1.82	.38	.57	.92	Calcium Cyanamide 10 lbs.
					SPRING APPLICATION:
16	5.50	2.25	4.00	3.54	Same as 16 above
17	4.00	1.07	2.44	2.50	Same as 17 above
18	4.22	2.38	2.44	3.02	Same as 18 above
19	1.88	.38	.57	.94	Same as 19 above

* Check—Unfertilized.

Corn Varieties and Fertilization

By J. C. Mercer, Georgia Mountain Experiment Station

Tests were conducted in 1939 on farms in Union County in cooperation with the Agricultural Extension Service, as to varieties, kind and rate of fertilizer applications, and the use of lime under corn.

In tests conducted on three different kinds of soil, in three different militia districts of Union County, Holcomb's Prolific corn was the highest yielding variety with an average of 41.8 bushels per acre, followed by Wood's Hybrid Golden Prolific with 40.9 bushels per acre.

Table I shows the yield of the ten varieties on the differently located fields and the average yield in bushels per acre of the three fields.

Table I.

Corn Varieties, Yield per Acre on Three Farms

Variety	Average bushels
Hickory King	30.7
Neal's Paymaster	34.0
Hastings' Prolific	34.8
Mosby's Prolific	34.1
Holcomb's Prolific	41.8
Whatley's Prolific	32.9
Wood's Hybrid White Dent	38.9
Wood's Hybrid Golden Prolific	40.9
Jarvis' Golden Prolific	33.8
Native	36.2

In fertilizer tests with seven series of plots, three of which were limed, the fertilizers giving the highest yields were two of those with equal ratios of N-P-K, that is, 12-12-12, 16-16-16 and the 12-4-4 mixture.

With 500 pounds of 12-12-12 costing approximately $8.84, 500 pounds of 16-16-16 costing $11.52, and 500 pounds of 12-4-4 costing approximately $5.18, it is evident that a 12-4-4 would be the most economical fertilizer even with a few bushels less than a 12-12-12 or 16-16-16 in yield.

From this series of tests an average application of 1-½ tons of ground limestone, applied at planting time, (1 ton on one field and 2 tons on another field) gave an increase of 9.3 bushels of corn per acre. The increase in yield from the use of lime was possibly greater due to an abundant rainfall during the growing season.

Table II.

Effect of Different Fertilizers With and Without Lime on Corn

Fertilizer N-P-K	Yield per acre: No lime bushels	Lime bushels	Average bushels
4-4-4	42.3	51.1	46.7
4-8-4	36.2	54.2	45.2
4-12-4	40.4	54.7	47.5
4-16-4	37.4	59.8	48.6
8-8-8	50.7	64.3	57.5
12-12-12	62.1	64.6	63.3
16-16-16	60.0	63.8	61.9
0-16-0	37.0	42.3	39.6
8-4-4	52.4	56.4	54.4
12-4-4	61.3	59.7	60.5
16-4-4	51.9	56.0	53.9
4-4-8	47.0	60.2	53.6
4-4-12	45.4	59.5	52.4
4-4-16	46.8	53.7	50.2
Average	47.9	57.2	52.5

Four replications on the unlimed, three on the limed. Fertilizer applied at the rate of 500 pounds per acre, lime at the rate of 1-½ tons per acre.

The lime alone increased yields 12.1 bushels per acre with no other fertilizer; 500 pounds of 4-8-4 increased the yield 21 bushels over the check, but when lime was applied in addition to the N-P-K, an additional 9.8 bushels per acre were obtained.

Indications are that for average conditions, one ton of lime will give better results the first year than a larger application, but, of course, will not last as long in the soil.

Table III.

Effect of Lime on Corn Yield per Acre

Field Location	Check bushels	500 lbs. 4-8-4 per acre bushels	Lime* 1 ton per acre bushels	Lime 1 ton* Phosphate, 150 lbs. per acre bushels	Lime 1 ton* 500 lbs. 4-8-4 per acre bushels
		64.6			58.7
Wiley Penland		53.0			47.1
		44.5			54.1
Gregory		42.9			
Tom Penland	29.7	69.6			
Dupree Miller	17.5	17.5	34.1	35.2	
Fred Turner	21.4	21.4	36.2	31.3	
Wayne Weaver	21.5	34.8	32.9	39.3	
Average	22.5	43.5	34.6	35.3	53.3

* Ground limestone.

A Study of State Fertilizer Control Bulletins

By GUS M. OEHM

Ammonia Department, E. I. du Pont de Nemours & Company, Wilmington, Delaware

A STATE Control Bulletin carrying a report of the official chemical analysis of thousands of samples of fertilizers, while important to the fertilizer industry and the farmer, makes rather monotonous reading. Many State Control Chemists restrict their published reports to the statistics required by law. The usual practice is to publish the fertilizer manufacturer's firm name and address, followed by the "guaranteed" and "found" plant food of each sample. The official analysis usually indicates that guarantees are met or exceeded. Such minor discrepancies as to occur indicate little or no intentional attempt to violate control regulations.

Fertilizer manufacturers make considerable use of these State Control Bulletins, and farmers often refer to them before deciding on their fertilizer purchases. With such circulation and use, the Official Control Bulletins become exceptionally suitable media for presenting other data relating to fertilizers. A study of recent issues of these Bulletins shows that this fact is recognized by many States, which now include valuable supplemental information, as reviewed in the following discussion.

A recent consumer survey conducted by The National Fertilizer Association brought out the fact that many farmers continue to buy fertilizers on the basis of cost per ton. Some Control Bulletins are helping to clarify this matter by carrying information which will undoubtedly help teach consumers to think in terms of "cost per pound of plant food" rather than "cost per ton of fertilizer."

For instance, a recent Vermont Control Bulletin includes the following table, giving information which shows that, since 1934 there has been a gradual increase in the plant-food content in each ton of fertilizer used in that State, with a consequent reduction in the cost per pound of plant food:

	1934	1935	1936	1937	1938	1939
Approximate average retail price (per ton)	$39	$36	$40	$41	$42	$42
Approximate average pounds plant food (per ton)	424	434	438	471	482	480
Approximate average price per pound of plant food (cents)	9.2	8.3	9.1	8.7	8.7	8.8

An Indiana Bulletin shows the cost of plant food has declined from a high of 11.6 cents per pound in 1920 to 8.0 cents in 1930 and 6.5 cents in 1937.

Facts on Concentration and Its Relation to Cost

Many Control Bulletins include information on plant-food concentration and its relation to fertilizer cost. For example, a South Carolina Bulletin shows the savings obtained by using a 4-12-4 instead of the old 3-8-3. One ton of 3-8-3 supplies 280 pounds of plant food at a cost of $23.67. But 1,400 pounds of 4-12-4, which costs $28.13, per ton, will supply the same quantity of plant food at a cost of only $21.09, or at a saving of $2.58.

A Texas Control Bulletin presents cost figures for equivalent amounts of plant food supplied in fertilizers of three different concentrations, as follows:

Tons	Grade	Cost
1.67	3-10-3	$48.13
1.25	4-12-4	41.27
1.00	5-15-5	39.22

Vermont includes a table showing that the plant-food costs decrease as the concentration of the fertilizer increases. Thus, the average cost is 10.6 cents per pound of plant food in fertilizers containing 15 to 17 units, compared with 9.5 cents per pound when the concentration is increased to 20 or 21 units. The cost reaches a low of 6.5 cents per pound of plant food in grades containing 38 to 44 units. The South Carolina Bulletin quoted previously demonstrates that the cost of fertilizer to the consumer is determined by two major factors:

1. The wholesale cost of materials.
2. The cost of manufacture and distribution.

The cost of manufacture and distribution is approximately the same regardless of the concentration. The fertilizer consumer can do relatively little to reduce these cost factors, but by spreading these costs over a larger number of units per ton (higher concentration), some real savings result. The inclusion of this type of information is of especial value to farmers who do not understand the difference between price per ton and price per unit of plant food.

Data Help Grade-Reduction Program

Many State Control Bulletins include articles and appropriate illustrative tables and charts on the number and tonnage of fertilizer grades. This helps to educate the consumer and to promote the program of grade reduction which has been started in many States.

One finds, for example, that recent Control Bulletins report that over 80 grades were sold in Massachusetts, of which only five or six grades supplied well over 90 per cent of the total used in that State; and that 160 grades were sold in Virginia, where only about ten grades were needed to supply over three-fourths of the total used. This is true in many other States, where a large percentage of the total is confined to a few grades, with a large number of other grades accounting for only a small tonnage each.

Agronomists quite generally agree that a relatively small number of fertilizer grades in any one State is adequate for all possible variations of crops and of soil conditions. It is also agreed that a reduction in grades tends to reduce fertilizer-manufacturing costs. A multiplicity of grades is said to confuse rather than to help farmers.

Importance of Basicity of Fertilizers

Many States now require a guarantee of the acidity or basicity of fertilizers, and report the results of their inspection for this factor in their Control Bulletins. Some other States, not required by law to make this determination, report acidity as a service to the consumer. Regardless of whether a State is required by law to report on acidity or basicity, explanations of the value of non-acidforming fertilizers will undoubtedly increase the demand for this type of fertilizer for most crops. The additional calcium and magnesium supplied by the limestone in neutral fertilizers usually makes them more efficient.

The Massachusetts Control Bulletin takes advantage of the opportunity to report that the average acidity of fertilizers in that State has declined from 235 pounds per ton (expressed in terms of calcium carbonate) in 1934 to 109 pounds in 1937. Vermont presents data showing that it would require an application of 526 tons of limestone to neutralize the acidity developed by the 7,821 tons of complete fertilizer sold during the year, and concludes that "it can be readily seen that the use of the average complete fertilizer sold in Vermont tends to induce soil acidity." It then gives this sound advice: "Farmers who buy brands which tend to increase soil acidity will do well to use lime." This supplemental discussion makes dead statistics come to life; makes them useful and instructive.

Great Variety of Supplemental Facts Being Presented

Some States, notably Massachusetts and Texas, make a practice of regularly inspecting and appraising the value of new materials offered for consideration of consumers. The report is made in their Control Bulletins. Massachusetts, for instance, has compared the nitrogen availability in various forms of natural organics.

The wide variety of subjects discussed in some Control Bulletins can be seen from the following headings, picked at random:

Definitions of Fertilizer Materials and Terms.

Acid-Base Balance in Mixed Fertilizers.

Quality of Plant Food.

Fertilizer Grades and Price Data.

What Does One Get in Modern Commercial Fertilizer?

Fertilizer Should Be Purchased on Basis of Plant Food.

Why 16 Units or More?

Recommended Fertilizer Ratios and Analysis.

The Method, Time, and Rate of Applying Fertilizers.

Bulletins containing such information are rendering real service to the farmer-consumer. He is usually plentifully supplied with sales propaganda, continually visited by salesmen, and often perplexed by the large number of grades offered for use on a particular crop. Unbiased information supplied by his Control Bulletin may very well assist the consumer in making an intelligent purchase.

Some States Have Shown the Way

For a variety of useful information the Bulletins of Massachusetts, Texas, Indiana, and Vermont can hardly be surpassed. As indicated in the foregoing discussion, others have also made considerable progress. These Control Officials are to be commended for the excellent use they have made of the opportunity to present facts other than routine analytical reports. The inclusion of this valuable supplemental information requires only a few additional pages, and enhances the value of the Bulletin manyfold.

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AAA Payments in 1938 Program Total Half Billion

Total certifications for payments and obligations under the 1938 AAA Farm Program amounted to $499,532,875, through December 31, 1939, the Agricultural Adjustment Administration has announced. The total for the 1938 Program compares with approximately $400,000,000 for the 1936 program and approximately $326,000,000 for the 1937 Program. Of the 1938 total, $464,832,875 represents payments already disbursed or due to be disbursed under the 1938 Agricultural Conservation Program including payments to farmers in the continental and insular regions together with national and local administrative expenses.

Distribution of the AAA 1938 agricultural conservation payments and obligations as of December 31, 1939, by states, is as follows:

Maine	$1,953,753.68
New Hampshire	217,502.10
Vermont	569,736.78
Massachusetts	457,143.68
Rhode Island	40,443.26
Connecticut	462,504.85
New York	3,508,441.86
New Jersey	1,235,974.33
Pennsylvania	3,886,147.37
Maryland	1,641,396.57
Delaware	595,733.00
Virginia	4,729,044.85
West Virginia	1,376,677.87
North Carolina	15,025,336.08
Kentucky	10,172,663.60
Tennessee	11,478,521.24
South Carolina	12,286,852.59
Georgia	18,483,008.59
Florida	3,089,180.68
Alabama	17,860,043.04
Mississippi	21,892,515.46
Arkansas	17,878,566.77
Louisiana	10,803,062.12
Oklahoma	17,925,503.10
Texas	63,764,159.20
Ohio	9,319,358.75
Indiana	10,773,035.26
Illinois	18,779,029.52
Michigan	6,885,489.27
Wisconsin	10,000,662.76
Minnesota	16,298,205.11
Iowa	28,637,684.12
Missouri	13,798,240.95
South Dakota	14,395,691.25
Nebraska	13,558,301.40
North Dakota	17,468,314.80
Kansas	16,072,518.83
Montana	7,162,291.30
Idaho	2,814,375.00
Wyoming	1,745,146.17
Colorado	4,830,885.80
New Mexico	3,438,155.70
Arizona	2,633,263.14
Utah	702,720.48
Nevada	148,888.20
Washington	3,710,465.76

Oregon	3,364,074.60
California	9,192,223.37
Salt Lake City Laboratory	143,373.44
Alaska	1,289.51
Hawaii	109,198.56
Puerto Rico	1,687,114.36
Total	$459,003,910.08

General administrative expenses bring the total to $464,832,875.44.

MARCH SULPHATE OF AMMONIA PRODUCTION INCREASES

The statistics compiled by the U. S. Bureau of Census show that in March the production of by-product sulphate of ammonia amounted to 56,059 tons, an increase of 4.8 per cent over the 53,475 tons in February, and of 20 per cent over the 46,670 tons in March, 1939. For the first quarter of 1940, the output totaled 169,927 tons, as compared with 134,206 tons during the same period of 1939.

By-product ammonia liquor output came to 2,252 tons (NH_3 content) in March, 1940, showing little change from the figures for February, 2,267 tons. Production for the first quarter of 1940 amounted to 6,923 tons, which during the same months of 1939, the output was 5,770 tons.

WORK ON NEW N.F.A. MOTION PICTURE STARTED

With the approval of the Soil Improvement Committee of the National Fertilizer Association, preliminary work has been started on a new Kodachrome motion picture on fertilizer application. It will summarize important features of the work that has been done by the National Joint Committee on Fertilizer Application and many cooperating agencies, in terms which will teach farmers these profitable methods. A number of early planting scenes already have been photographed at Tifton, Ga.; Florence, S. C.; and Norfolk, Va. The picture is being produced in cooperation with the U. S. Department of Agriculture and a number of experiment stations. The producers have already received generous offers of assistance. In some cases crops are being planted especially for the purpose of securing the right pictures. In addition to showing the application of fertilizer to cotton, corn, potatoes, tobacco, grains, vegetables, and fruits, the film will also dramatize the effects of methods of application on germination, early growth, final growth, and yield.

BILL INTRODUCED FOR COTTON FERTILIZER BAGS IN SOUTH CAROLINA

A bill has been introduced in the South Carolina Legislature which would prohibit the sale in South Carolina of any fertilizers, fertilizing materials, "except sixteen per cent (16%) acid phosphate, or any material ordinarily used as feed for livestock or poultry, including cottonseed meal and hulls from cottonseed, where the same is contained in packages of 50 pounds or more, unless the same be in sacks or containers made from cotton fabric." Provision is made for permission to use other fabric now on hand or to package bulk material on hand in fabric other than cotton, but such permission is not to extend beyond January 1, 1941. The bill has been reported favorably by the Senate Committee to which it was referred.

PYRITES IMPORTS, 1939

The imports of pyrites in the United States during 1939 total 482,336 long tons, an important gain over the previous year, but somewhat less than the 524,430 tons reported during 1937. Substantially all of the pyrites entered during the 5 years ended 1938 originated in Spain; in 1939 Canada accounted for almost 35 per cent of the volume.

Pyrites Containing More Than 25 Per Cent Sulphur Imported into the U. S.

Country of Origin	1938 Long tons	1938 Value	1939 Long tons	1939 Value
Canada	30,064	$135,659	176,804	$470,336
Mexico	202	522	...	...
Spain	303,968	709,983	282,732	738,439
Greece	...	...	22,800	106,271
Total	334,234	846,164	482,336	1,315,046

HUGE QUANTITIES OF PHOSPHATE REMOVED FROM SOIL ANNUALLY

The Tennessee Extension Service reports that phosphate is being cropped and eroded from the Nation's soils at the rate of 4,000,000 tons of the pure element, or about 28,000,000 tons of high-grade phosphate rock per year.

NITROGEN PRODUCTS, INC. MOVE OFFICES

About May 1st the offices of Nitrogen Products, Inc., in New York City, will be moved to 110 East 42nd Street. This new location is opposite the Grand Central Station and will be convenient for out-of-town visitors.

Guano Production Declined in Peru

Guano production in Peru during 1939 amounted to 152,778 metric tons, as compared with 168,633 tons removed from the islands in 1938. Average annual production for the period 1925 to 1935 was 119,522 metric tons, and for the years 1935-1938 145,560 tons.

Among the principal factors contributing to the increased cost of production during 1939 were: a decrease in tonnage, the lower average nitrogen content of the rich quality; the payment of duties on the empty sacks, supplies and materials imported, which were exonerated from the payment of duty the year before; a general increase in the price of materials, foodstuffs and medicines; the increased prices paid for foreign supplies at the higher rates of exchange throughout the year; and the fact that 1939 production costs were applicable to a full 12-month period, as compared to a 9-month period in 1938.

The nitrogen content of the rich quality averaged 13.575 per cent during 1939, as against 13.96 in 1938. This quality was satisfactory to national farmers as well as to foreign buyers.

As is usually the case, orders placed by local agriculturists exceed by about 50 per cent the actual amount of guano available for distribution. Sales to national agriculturists in 1939 amounted to 137,105 metric tons, as compared with 147,857 during 1938. Revised orders received by the guano administration during 1939 were for 210,029 metric tons, an increase of 1,913 tons as compared with the 208,116 ordered in 1938.

Exports consisted of 10,575 English tons (of 1,016 kilograms) shipped to the Anglo Continental Guano Works, Ltd., London during the year, and 4,700 tons (of 1,016 kilograms) to a New York firm.

In June of 1939 the sale of an additional 4,000 or 5,000 tons of guano to the Anglo Continental Guano Works was authorized at the price of £1.15.0 per ton of 1,016 kilograms; however, this sale was suspended, owing to the outbreak of war in Europe.

In view of the increased demand for rich guano, orders having surpassed the normal production of this type in recent years, the administration continued to favor the use of natural or synthetic nitrogenous fertilizers. During the year the guano company, in accordance with the supreme resolution on the subject dated November 25, 1937, purchased 50 tons of sodium nitrate and 50 tons of potassium nitrate. An agricultural engineer was contracted to supervise the distribution of the fertilizer among the 1,130 farmers who were instructed on the advantages of employing nitrate as a complementary fertilizer of guano in certain types of farming.

Owing to the unfavorable climatic conditions prevailing during 1939, it is expected that the 1940 production will be diminished further. The annual survey of the islands, which are worked under the system of rotation, is now being conducted in order to determine the amount to be removed during the fiscal year. Until these figures are available, and the requirement of local farmers are received, the approximate amount for exportation during 1940, if any, will not be known.

POTASH COMPANY CHANGES NAME

On April 16th, the French Potash & Import Co., Inc., announced that it had succeeded the former French Potash Company. We understand that the change in the name of the company does not involve any change in executive or administrative personnel. The headquarters of the company will be continued at 30 Rockefeller Plaza, New York, with branch offices in the principal fertilizer centers.

BRADLEY & BAKER

FERTILIZER MATERIALS - FEEDSTUFFS

AGENTS - IMPORTERS - BROKERS

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BRANCHES

Clinton St. & Danville Ave.
Baltimore, Md.

505 Royster Building
Norfolk, Va.

505 Barnett Bank Building
Jacksonville, Fla.

FERTILIZER MATERIALS MARKET

NEW YORK

Weather Conditions Still Unfavorable in North and Middle West. Materials In Better Demand. Sulphate of Ammonia Very Scarce.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, April 23, 1940.

Unusual weather conditions are still hampering deliveries of fertilizers in the middle west and in the east, but in spite of this condition there has been a slightly better demand for certain raw materials.

Sulphate of ammonia continues to be the one material which is extremely scarce and high prices are being quoted for export inquiries which have been in the market.

Nitrate of Soda

Price is firm at $27.00 in bulk, $28.30 in 200-lb. bags and $29.00 in 100-lb. bags, port basis.

Castor Pomace

This market has not changed and material is still available at ports at $2.35 per unit of ammonia ($2.85½ per unit N).

Nitrogenous Material

There is very little new business for prompt delivery, but quite considerable quantities have been sold for the new season at price of about 25 cents per unit of ammonia under the price at which early business was placed a year ago for the present season.

Potash

There is no change in this market, potash being available as needed at 53½ cents per unit K_2O, in bulk, basis ex vessel.

Superphosphate

The market is firm but unchanged at $8.50 per ton for run-of-pile material for domestic use.

Fish Scrap

There has been little movement in this market and sales have been reported at $3.35 ($4.07 per unit N) and 10 cents.

Triple Superphosphate

This material remains in good demand. No prices are available for new seasonal business although offerings are made to the U. S. Government for delivery through October of this year. The probability is that higher prices for triple superphosphate will prevail for the new season.

Dried Blood

The New York market is higher at $2.80 (3.40½ per unit N), and the South American has weakened and is now $2.85 (3.46½ per unit N).

ATLANTA

Hard Winter and Late Spring Causes Confused Season. Ample Moisture for Good Crops. Material Market Quiet.

Exclusive Correspondence to "The American Fertilizer."

ATLANTA, April 22, 1940.

The spring fertilizer season, while over in some parts of the deep south, is still on in full blast in other sections, with producers trying to supply the demand between changes of weather that is slackening and expediting business.

This is one of the latest springs on record and comes on the heels of the worst winter the south has seen since 1917. If the farmers can ever get their crops planted and get any sort of a break on weather from now on, a good yield should be in prospect as there is ample moisture in the ground.

The fertilizer picture changes from day to day as numerous key ingredients are more or less linked to world affairs. Fortunately, there is no shortage of potash as yet and we are largely indebted to the French for this condition.

Quotations are as follows:

Tankage.—Imported, $3.25 ($3.95 per unit N) and 10 cents; domestic, $2.50 ($3.04 per unit N) and 10 cents Chicago.

Nitrogenous.—$1.75 ($2.12½ per unit N), western producing points; foreign, $2.25 ($2.73½ per unit N), c.i.f. the ports.

KNOW - - - -

- - TO A CERTAINTY

the number of pounds of raw material for a desired per cent. of plant food in a ton of mixed goods—or find what per cent. of a certain plant food in a ton of fertilizer produced by a specific quantity of raw materials.

No mathematical calculations are necessary. You can find the figures in a few seconds with the aid of

Adams' Improved Pocket Formula Rule

A Great Convenience for the Manufacturer of High Analysis Goods

To make clearer its use, answers to such problems as the following can be quickly obtained:

How much sulphate of ammonia, containing 20 per cent. of nitrogen, would be needed to give 4½ per cent. nitrogen in the finished product?

Seven hundred and fifty pounds of tankage, containing 8 per cent. phosphoric acid are being used in a mixture. What per cent. of phosphoric acid will this supply in the finished goods?

Should the Adams' Formula Rule become soiled from handling, it may be readily cleaned with a damp cloth.

PRICE $1.00
TO BE SENT WITH ORDER.
Special quotations on twelve or more.

Ware Bros. Company

Sole Distributors

1330 Vine Street :: PHILADELPHIA

Blood.—Imported, $3.10 ($3.77 per unit N), c.i.f.; domestic, $2.80 ($3.40½ per unit N), basis f.o.b. Chicago.

Nitrate of Soda.—No change.

Sulphate of Ammonia.—Producers behind with orders but no change in price. Export demand has slackened off on account of increased freights.

Fish Meal.—Menhaden, spring season late, fishing poor. Producers are booked ahead and reluctant to contract further quantities at this time.

Raw Bone Meal.—4½ and 45 per cent, $31.50.

Steamed Bone Meal.—3 and 50 per cent, $30.00.

Cottonseed Meal.—Prime 8 per cent, Memphis, $30.00; southeastern mills, $31.50.

BALTIMORE

Weather Retards Spring Season. Export Demand for Sulphate of Ammonia Still Continues. Ammoniates Ruling Easier.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, April 23, 1940.

During the past two weeks, unfavorable weather conditions continued with the result that the spring season has fallen that much further behind. Manufacturers are hopeful that the weather will be favorable from now on to enable them to, at least, part-way catch up on tonnage, but it now begins to look as though it will be a physical impossibility to ship a normal tonnage this spring.

Ammoniates.—The market on feeding tankage has eased up somewhat, and ground animal tankage is ruling easy around $3.30 per unit of nitrogen and 10 cents per unit of B. P. L., f.o.b. Baltimore. The peak of the season is now about over, and buyers are, therefore, anticipating lower market.

Nitrogenous Material.—Inquiry for this class of goods is practically at a standstill, and the market continues nominally unchanged at $2.90 per unit of nitrogen, but there is absolutely no business passing.

Sulphate of Ammonia.—The situation on deliveries is still tense, and it is impossible for the mills to keep up with the demand. There is practically no resale material to be had even at a premium of $5.00 to $6.00 per ton over and above the schedule. First hands are already so far behind in deliveries that it is impossible to consider any further business for this season's delivery. After the season is over, it is anticipated that the export demand will take up the summer production, which will make for a firmer situation in the market than might otherwise be the case.

Nitrate of Soda.—There has been a pick-up in deliveries against contracts previously booked, but this is usual at this time of the year, and the market on both Chilean and domestic brands continues unchanged at $29.00 per ton of 2,000 lb., in 100-lb. bags, f.o.b. port warehouse, with usual differential in 200-lb. bags and in bulk.

Fish Meal.—The demand continues to ease up, although the market is fairly firm at $58.00 per ton of 2,000 lb., in bags, guaranteed 55 per cent protein.

Superphosphate.—There is no change in the market, but manufacturers are now busy making deliveries against contracts, and the price remains firm at $8.50 per ton of 2,000 lbs., basis 16 per cent for run-of-pile, and $9.00 for flat 16 per cent grade, both in bulk, f.o.b. Baltimore.

Potash.—There has been no new movement in this material as, between importers and domestic manufacturers, there is ample tonnage for buyers' legitimate requirements, and no

Manufacturers' Sales Agents for **DOMESTIC**

Sulphate of Ammonia

Ammonia Liquor :: Anhydrous Ammonia

HYDROCARBON PRODUCTS CO., INC.

500 Fifth Avenue, New York

change in price is anticipated until after the close of the present season, if then.

Bone Meal.—With inquiry at a minimum, domestic 3 and 50 per cent steamed bone meal continues to be quoted at $32.00 to $35.00 per ton, with 4½ and 47 per cent South American raw bone meal ranging in price from $30.00 to $32.00 per ton, c.i.f. Baltimore.

Bags.—The market on burlap has again been fluctuating and, while during the past two weeks it reached higher levels, it is now back again to about $112.00 per thousand for plain, new, 10-oz. basis 40 cut 54 in., delivered Baltimore.

WILMINGTON

Smaller Fertilizer Tonnage Expected, Due to Tobacco Acreage Decrease. Little Activity in Materials Market.

Exclusive Correspondence to "The American Fertilizer."

WILMINGTON, April 22, 1940.

The fertilizer season is fast drawing to a close. Manufacturers report that orders have fallen off to where they are only a "trickle." It is a little difficult as yet to get a very accurate figure as to what the movement this year will be as compared to last, but most of the port plants claim that there will be a decrease from 1939 of at least 25 per cent, while interior manufacturers believe that they will do better and that a decrease of 15 per cent will be all they will suffer.

The decrease in tobacco acreage has hit the fertilizer manufacturers very heavily but the increase in cotton planting will help considerably.

It would now appear that the use of nitrate of soda will be ahead of last year, but weather conditions in May and June control the use of nitrate to such an extent that it is impossible at this time to do more than guess.

Organics generally are very weak, owing to the decline in tobacco goods. Muriate of potash moving from resellers at 5 per cent off the list, but sulphate of potash is strongly held at the list net, and sulphate of potash magnesia, where found, is held at the list plus $5.00 per ton.

Fishing has so far been very poor but the market is strong. Dried scrap is being offered in limited quantities at $43.00 per ton, and acid scrap at $2.50 ($3.04 per unit N) and 50 cents.

TENNESSEE PHOSPHATE

Weather Handicaps Planting of Crops. Fertilizer Shipments Heavy. Some Freight Rates Lowered.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., April 22, 1940.

Alternate periods of almost summer weather, interspersed between at least three of the customary spring-winters, have characterized the past two weeks. Heavy spring rains have almost put the creeks and rivers out of banks and have entirely made up the deficiency of normal precipitation for 1940.

Farmers are considerably behind in all their work, corn planting and tobacco setting being about as far behind as they can well be to make crops.

Fertilizer movement continues heavy, but price cutting is reported as actively under way, largely on account of the government supply through AAA programs which, of course, should not be of any effect on any fertilizer materials being used for soil depleting crops. The fact is, however, that the competition is very keenly felt and it is alleged on all sides that much if not most of the "Government Fertilizer" is being taken by people who fully intend to and are using it for regular row fertilization.

Shipments of phosphate rock from the field continue in good volume to fertilizer manufac-

PULVERIZED
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"It's a Dolomite"
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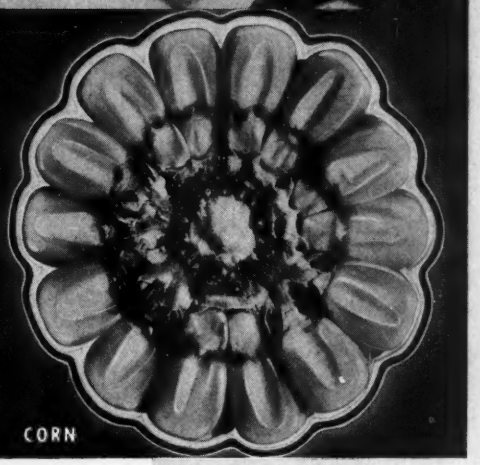
SUNSHINE STATE

POTASH

FOR SPRING PLANTING

COTTON

TOBACCO


CORN

IN the Spring, a farmer's thoughts turn to planting crops. And the first step in the growing of quality and quantity crops is an adequate use of proper grade fertilizer containing the right quantity of Potash.

Cotton, corn, and tobacco, as well as many other crops, are benefited by fertilizer containing Sunshine State Potash, specified to fit local conditions of soil and climate.

Fertilizer producers know the right formula for the right job. They like Sunshine State Potash because of its consistently uniform analyses of Muriate of Potash and Manure Salts, and the careful sizing that makes handling and blending easy.

HIGRADE MURIATE of POTASH
62/63% K_2O Also 50% K_2O Grade

MANURE SALTS
Approximately 30% K_2O

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SUNSHINE STATE POTASH
A PRODUCT OF NEW MEXICO U.S.A.

UNITED STATES POTASH COMPANY
INCORPORATED
30 Rockefeller Plaza, New York, N. Y.

turers, while the April movement of ground phosphate rock to farmers for direct application has so far greatly surpassed the 1939 movement in same month. One large shipper who had laid in what was supposed to be ample stock of printed bags, has run out entirely and has to use plain bags until more can be had, which on account of the war are hard to get on short notice.

Regulations regarding sales tax are being interpreted in Illinois to make sales tax apply to shipments of phosphate from outside states subject to this tax. This would, of course, involve another increase in cost to the farmers who use most of the rock phosphate for direct application. It is thought that, as the tax does not apply to feeds bought for dairy cattle and for hogs and other livestock to be marketed, it would not apply to phosphate bought to raise feed and farm products for sale, but this is not yet determined definitely.

Application of class freight rates into Missouri and Kansas, which were withdrawn in June, 1939, have been restored by western lines, and also extended to points in Wisconsin, Minnesota, Dakotas, and Iowa, which will reduce the existing rates around two dollars per ton. The red tape of notifying the Southern Freight Association and final acceptance by that body and ultimate publication by initiating carriers will probably delay action until the present spring season is over.

CHICAGO

European War Creates More Active Fertilizer Organics Market. Feed Materials Also Advance.

Exclusive Correspondence to "The American Fertilizer."

CHICAGO, April 22, 1940.

The latest developments in the European situation have caused a more active market in organics, some sales for summer shipments having been consummated. These trades have resulted in sellers adopting a more bullish position, and consequently higher asking prices prevail. Recent renewed buying occurred in the bone meal market, which remains steady with light supply.

Owing to advance to $50.00 per ton on digester tankage and meat scraps, a strong market in feed materials is now ruling, with sales of wet rendered tankage at advances of 30 cents to 40 cents per unit of ammonia.

Nominal prices are as follows: High-grade ground fertilizer tankage, $2.40 to $2.50 ($2.91½ to $3.04 per unit N) and 10 cents; standard grades crushed feeding tankage, $3.00 to $3.15 ($3.64½ to $3.83 per unit N) and 10 cents; blood, $2.75 to $2.85 ($3.34½ to $3.46½ per unit N); dry rendered tankage 70 to 75 cents per unit protein, Chicago basis.

PHILADELPHIA

Greater Activity in Materials Market. Prices Somewhat Higher.

Exclusive Correspondence to "The American Fertilizer."

PHILADELPHIA, April 23, 1940.

Fertilizer materials were more in demand and prices tightened slightly. Contract deliveries are heavier.

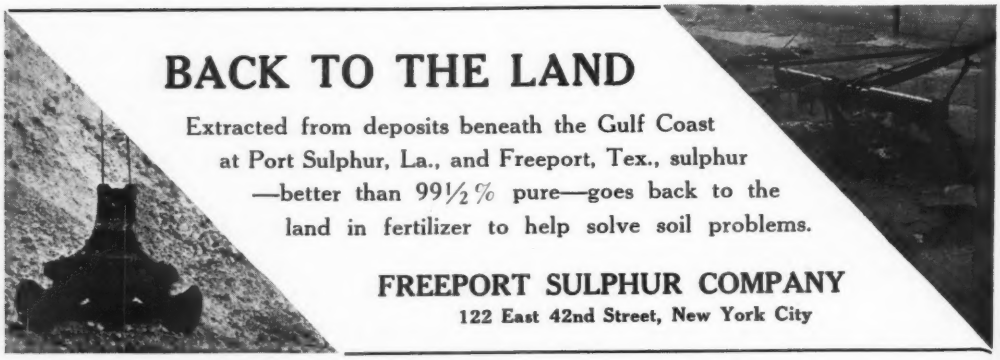
Nitrate of Soda.—Deliveries heavier. Price remains $27.00 in bulk, with usual differential for 200 and 100-lb. bags.

Sulphate of Ammonia.—Very strong. Export shipments continue heavy.

Dried Blood.—Firmer. Being quoted at $2.85 to $2.90 ($3.46½ to $3.52½ per unit N).

Tankage.—Stronger. Being quoted at about $2.75 to $2.80 per unit of ammonia ($3.34½ to $3.40½ per unit N) and 10 cents per unit B.P.L.

Bone Meal.—In good demand. 3 and 50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✣

BONE MEALS

✣

POTASH SALTS

✣

DRIED BLOOD

✣

TANKAGES

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COTTONSEED MEAL

✣

BONE BLACK

✣

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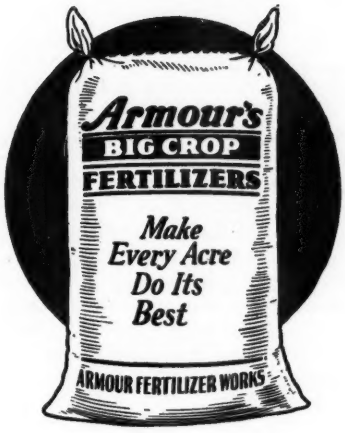

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San Juan, P. R.
Sandusky, Ohio
Wilmington, N. C.

per cent about $32.00 to $33.00; 4½ and 45 per cent at $34.00 to $35.00.

Superphosphate.—Firm. Price remains the same.

Potash.—Syndicate schedule prevails.

THE ANNUAL REPORT TO EMPLOYEES

In the past two years there has been a rapid growth in the number of companies issuing special annual reports to employees as a means of giving them a better understanding of company problems. Like the stockholder's dividends, the security of the employee's job depends upon a company's earnings. The employee thus has a direct interest in the results of a company's operations. This at least is the conclusion of 116 companies whose practices in issuing annual reports to employees are described in a new report, "The Annual Report to Employees," prepared by the Policyholders Service Bureau of the Metropolitan Life Insurance Company.

The report shows the varied and ingenious ways that financial statements are being presented and interpreted in these employee reports so as to make them understandable to those unversed in accounting terms. The study describes and illustrates the different methods of presentation employed, the media through which the report is transmitted, subject matter, physical make-up and related topics. The objectives of this type of activity and the results that may be expected by management are also discussed.

In the report particular attention is given to the trends and changes that have taken place in these employee reports—the new and improved practices that have been developed—by making comparisons between the most recent editions of such reports with those issued in prior years. Free use is made of illustrations and excerpts from typical reports are included. An appendix lists the names of companies that have provided such reports for employees.

Copies of "The Annual Report to Employees" are available from the Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue, New York.

COTTON SURPLUS REDUCED

Domestic and foreign consumption prospects now indicate that the world carry-over of American cotton on August 1, 1940, is likely to be about 1,000,000 bales smaller than the record high carry-over of 14,000,000 bales on August 1, 1939, the Bureau of Agricultural Economics reports. The carry-over in the United States seems likely to be about 2,000,000 bales less than at the beginning of the current season—when the total was about 13,000,000 bales—but stocks of American cotton in foreign countries are expected to increase by 1,000,000 bales or more. The world carry-over will be the third largest on record and about two-fifths larger than the ten-year 1929-1938 average.

FERTILIZER BRINGS PENNSYLVANIA FARMERS MORE THAN TWENTY-TWO MILLION DOLLARS

The gigantic sum—three billion dollars—which farmers have received from the Government under the AAA since 1933 is equaled by the extra dollar value of increased yields produced by fertilizer in the same period, according to estimates made from personal interviews with 32,000 farmers in 35 states.

Pennsylvania farmers gave the interviewers grass-root facts which show that for every dollar they spent for fertilizer they received an average return in increased yields of $2.41. In other words, Pennsylvania farmers spent $9,137,000 for fertilizer. The extra return which they received from its use amounted to $22,061,000, leaving an increased income above the cost of the fertilizer of $12,924,000.

The returns from each dollar Pennsylvania invested in fertilizer, as shown by The National Fertilizer Association survey, varied from crop to crop. Tomatoes led the list with an increased value return of $1.88. Tobacco ranked well up with a return of $5.22. Other crops reported were potatoes, which brought $3.78 for each dollar invested; corn $2.87; and apples, $2.60.

Pennsylvania farmers also had their say about the effects of fertilizer on quality of

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crops. Over 58 per cent said they got better market quality in all cash crops, while 68 per cent said they got better feeding quality in grain and hay and 20 per cent declared they observed better shipping quality in fruits and vegetables.

Average return in increased yields for all crops in all states shown by the survey was $3.60 for each dollar spent on fertilizer. Nationwide, the crops showing highest rate of return were: tobacco, cotton, fruits, and vegetables.

MISSISSIPPI FERTILIZER LAW AMENDMENTS PASSED

The proposed amendments to the Mississippi Fertilizer Law, as reported in THE AMERICAN FERTILIZER, April 13, 1940, have been passed by the legislature and signed by the Governor. The changes which will become effective on January 1, 1941, deal principally with a statement as to the acid- or non-acid-forming properties of fertilizer sold, and as to the availability of certain materials.

NEW YORK FERTILIZER TONNAGE

A report compiled by the Department of Agronomy, New York State College of Agriculture shows that fertilizer sales in New York in 1939 amounted to 318,992 tons compared with 332,881 tons in 1938. The decline was due to smaller sales of mixed goods, as superphosphate tonnage was practically the same in the two years and other materials showed a small increase. There was a sharp decline in mixed goods containing less than 20 units of plant food, while use of higher analyses increased. Comparative data for the two years follow:

	1938	1939
Total tonnage, all fertilizers	332,881	318,992
Mixed goods:		
Less than 20 units	102,184	41,765
20 to 30 units	88,220	123,655
Over 30 units	6,148	8,049
Not indicated	.....	5,940
Total	196,552	179,409
Superphosphate:		
20% or below	110,198	111,638
Above 20%	5,880	4,430
Total	116,078	116,068
Nitrogenous materials	16,035	19,072
Potash salts	1,590	1,895
Other fertilizer materials	2,626	2,548
Total	20,251	23,515

NATIVE MUCK MAKES EXCELLENT SOIL AMENDMENT

Connecticut is abundantly supplied with swamp muck or peat, a valuable resource that has never been exploited, declares Dr. M. F. Morgan of the Agricultural Experiment Station at New Haven.

When farming was practised more generally in the state, farmers claimed that this material, mixed with manure, greatly improved the fertility of their fields. The commercial product sold for gardens, lawns and horticultural purposes is too expensive for use on the acre basis today. However, many farmers own swamps containing deposits of muck that could be dug and worked into their land with good results.

Tests conducted at the greenhouse at New Haven show that native swamp muck is practically as valuable a soil amendment as the imported moss peat, now scarce because of the war. Neither material contains any significant amount of chemical plant food, but both are largely made up of humus. They are chiefly valuable for their ability to increase the moisture retentiveness of the soil. They also serve to prevent sandy soil from becoming hard and cloddy when dry, and clay soil from becoming tough or sticky when wet.

Moss peat is dried moss usually from Germany or Sweden. It is sold in compact bales weighing about 160 pounds, 85 per cent of which is organic matter. Muck is sold in bulk in a semi-dry condition. A cubic yard of good grade muck contains from 300 to 500 pounds of dry matter of which 60 to 90 per cent is humus. Approximately three-fourths cubic yard of Connecticut swamp muck is equivalent to a bale of imported peat moss.

The report of experiments with swamp muck and peat will be published as Circular 141, available in May.

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See Page 4

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70 Pine Street New York City

TRONA

COTTONSEED PRODUCTION

Figures issued by the U. S. Bureau of Census show that for the period from August 1, 1939, to March 31, 1940, a total of 3,973,035 tons of cottonseed had been received at the mills, as compared with 4,026,653 tons during the same period of 1938-39. Production of cottonseed cake and meal amounted to 1,705,095 tons during the same period of 1939--40, a slight decrease from 1,729,897 tons of August-March, 1938-39. Stocks on hand March 31, 1940, had decreased to 175,769 tons, compared with 195,092 tons on March 31, 1939.

30-YEAR FRUIT FERTILIZER FACTS

(Continued from page 8)

should be mentioned that the purpose of using the larger amounts of fertilizers was to study the different effects of such quantities, as some are very toxic and others are decidedly stimulative. In fairness to all materials mentioned in these experiments, it should be stated that the rates used in some cases are much higher than generally recommended. Manufacturers of calcium cyanamide caution not to use more than 300 pounds per acre or much over five pounds per tree of their material in most average soils, and in sandy or gravelly soils it is advised not to use more than 100 pounds per acre at one time. It is, however, interesting to note how much even such heavy applications as 10 pounds of calcium cyanamide per tree were improved when used with potash and acid phosphate.

Generally the cover crop response is observed as the more direct one to the application of complete fertilizers. The fruit trees in their earlier history do not show direct responses except from some of the nitrogenous applications. Just the same, as trees become older, where they are more crowded and in the less fertile soil situations, the chances of showing up the more direct responses to complete fertilization are more likely. Excellent examples of such responses are brought out in the Dean Price orchard.

In every instance where either or both phosphorus and potash were added to a nitrogenous carrier, very pronounced gains in growth and yields were obtained. The buds of the trees receiving a complete fertilizer combination were almost four times heavier than those receiving only a nitrogenous application. These responses developed in the first season of application, thus showing how quickly apple trees may respond to a complete fertilizer.

Conclusions

Apple trees are more likely to show more direct and marked growth and yield responses to complete fertilizers as they become older and root-crowded. Outstanding results were shown in the Price orchard with trees at a more advanced stage of root crowding as soon as one season after application. Although responses were not observable until sometime after the fifteenth year in the more favored trees in the station orchard, they nevertheless became manifest and showed with significance from then on.

In general, apple orchards of Virginia and in many sections adjoining are fairly well represented in most of their ultimate nutrient needs by the results secured either from the station or the Price orchard. Even though a wide chemical variation may exist, there are two physical factors that put most of the apple orchards on something of the same level. With the exception of some mountain cove orchards and perhaps some with deeper and lighter textured soils for root descent, the average orchards of Virginia have only between two to three feet of soil that can be penetrated by the roots of the apple trees. Coupled with this are the prevailing planting distances of the apple trees which over the State are of negligible variation.

Thus, on the whole, everything else being equal, the same varieties of apple trees over the State will all decrease in their rate of growth and yield when their root systems fill up their allotted soil areas to the degree of root crowding. From then on all of them will be on very much the same level of fertilizer needs. In 3-foot planting distances, all trees of the same variety after they are 20 to 25 years of age will come to much the same level of growth and yield rate decrease. Many of our Virginia orchards are just about at this stage of root-crowding at present.

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By H. J. WHEELER. A clear and unusually full discussion of the practical utilization of manures and fertilizers of all kinds and of their relations to the plant and to the soil. 389 pages. 5½ x 7½. Illustrated. Price $2.75.

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By W. H. WAGGAMAN. A comprehensive treatise, covering completely the subjects of phosphoric acid and phosphate—the sources, the processes of treatment, the products obtained, and their uses in agriculture and the arts. The volatilization process for producing phosphoric acid is fully discussed. In addition to the use of phosphate as a fertilizer material, there are chapters on phosphate baking powders, phosphate water softeners, and miscellaneous uses. This book is one of the American Chemical Society's technologic monographs and contains extended references to the literature, which facilitates further study of the subject. 366 pages. Price $5.75.

Potash Deficiency Symptoms

By OSKAR ECKSTEIN, ALBERT BRUNO AND J. W. TURRENTINE. A revised edition which explains in detail the signs of potash deficiency in all the important cultivated crops as shown in appearance and structure of leaf, root, fruit, etc.; also the influence of a lack of potash on resistance to plant diseases, pests and climatic factors. Printed in English, French and German. Profusely illustrated with 55 color plates and 41 black and white engravings. 248 pages. 7 x 9½. Price $2.25.

Potash: A Review, Estimate and Forecast

By J. W. TURRENTINE, M.S., PH.D., in charge of Potash Investigations, Bureau of Soils, U. S. Department of Agriculture. This book, written by an authority on the subject, covers in detail the American and foreign potash industry. This book deals with the technology of potash manufacture from numerous raw materials; the occurrence, properties and relative values of various potash minerals and the technology of extraction; the technology of utilizing potash-bearing industrial wastes for the manufacture of potash salts. European and other foreign sources of supply are given special attention. 188 pages. 6 x 9. Illustrations and tables. Price $3.00.

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By FIRMAN E. BEAR, PH.D. Second revised edition, covering the progress in the manufacture and use of fertilizers during recent years. The history of the science of fertilizers from the time of Jethro Tull to the present era. Fertilizer practice, both in Europe and America, is completely examined. The various schemes that have been proposed for determining what fertilizers to use are thoroughly treated. A comparison of fertilizers and their relative values is made. Also, there are concise statements of determining the fertilizer needs, and specific suggestions as to the use of fertilizers. 360 pages. 6 x 9. Price $4.00.

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A CLASSIFIED INDEX TO ALL THE ADVERTISERS IN "THE AMERICAN FERTILIZER"

This list contains representative concerns in the Commercial Fertilizer Industry, Including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
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American Cyanamid Co., New York City.

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BAGS (Waterproof)—Manufacturers
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Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

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Bagpak, Inc., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

BAG-CLOSING MACHINES
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A Classified Index to Advertisers in "The American Fertilizer"

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For an Alphabetical List of all the Advertisers, see page 33

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Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
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CABLEWAYS
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CALCIUM-NITRATE
Synthetic Nitrogen Products Co., New York City.

CAL-NITRO
Synthetic Nitrogen Products Co., New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
Du Pont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
Du Pont de Nemours & Co., E. I., Wilmington, Del.

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Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
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Fairlie, Andrew M., Atlanta, Ga.
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Sturtevant Mill Co., Boston, Mass.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Co., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

Andrew M. Fairlie
CHEMICAL ENGINEER
22 Marietta Street Building **ATLANTA, GA.**
CABLE ADDRESS: "SULFACID ATLANTA"

SULPHURIC Acid Plants . . . Design, Construction, Equipment . . . Operation . . . Mills-Packard Water-Cooled Acid Chambers, Gaillard Acid-Cooled Chambers, Gaillard Acid Dispersers, Contact Process Sulphuric Acid Plants.

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Sturtevant Mill Co., Boston, Mass.

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Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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Sackett & Sons Co., The A. J., Baltimore, Md.
Sturtevant Mill Co., Boston, Mass.

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Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
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Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Co., Columbus, Ohio.
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U. S. Phosphoric Products Corp., New York City.

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Link-Belt Company, Philadelphia, Chicago.
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GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
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Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

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American Agricultural Chemical Co., New York City.

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Sackett & Sons Co., The A. J., Baltimore, Md.

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American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Bradley & Baker, New York City.
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LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
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Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

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Atlanta Utility Works, East Point, Ga.

MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MANGANESE SULPHATE AND CARBONATE
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MANGANESE SULPHATE
Tennessee Corportion, Atlanta, Ga.

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Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.
Sturtevant Mill Co., Boston, Mass.

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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Company, The, New York City.
Bradley & Baker, New York City.
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Huber & Company, New York City.
International Agricultural Corp., New York City.
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Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
Chemical Construction Corp., New York City.

NITROGENOUS ORGANIC MATERIAL
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
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Baker & Bro., H. J., New York City.
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NOZZLES—Spray
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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Stedman's Foundry and Mach. Works, Aurora, Ind.

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Schmaltz, Jos. H., Chicago, Ill.
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Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

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Chemical Construction Corp., New York City.

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Stedman's Foundry and Mach. Works, Aurora, Ind.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
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Schmaltz, Jos. H., Chicago, Ill.
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POTASH SALTS—Manufacturers and Importers
American Potash and Chem. Corp., New York City.
Potash Co. of America, Baltimore, Md.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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Sturtevant Mill Co., Boston, Mass.

PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
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SHOVELS—Power
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U. S. Phosphoric Products Corp., New York City.
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Armour Fertilizer Works, Atlanta, Ga.
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TANKAGE
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Wellmann, William E., Baltimore, Md.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

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Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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UREA-AMMONIA LIQUOR
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By-Products *and* Fertilizer Materials

(SINCE 1898)

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PHILADELPHIA, PENNA.

E. DOUGHERTY, JR., Manager

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WE MAKE ANALYSES OF ALL KINDS
130 Cedar Street :: NEW YORK

SHUEY & COMPANY, Inc.
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Use this Hayward Class "K" Clam Shell for severe superphosphate digging and handling.
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Blood
Bone
All Ammoniates

Jos. H. Schmaltz
BROKER
FERTILIZER MATERIALS

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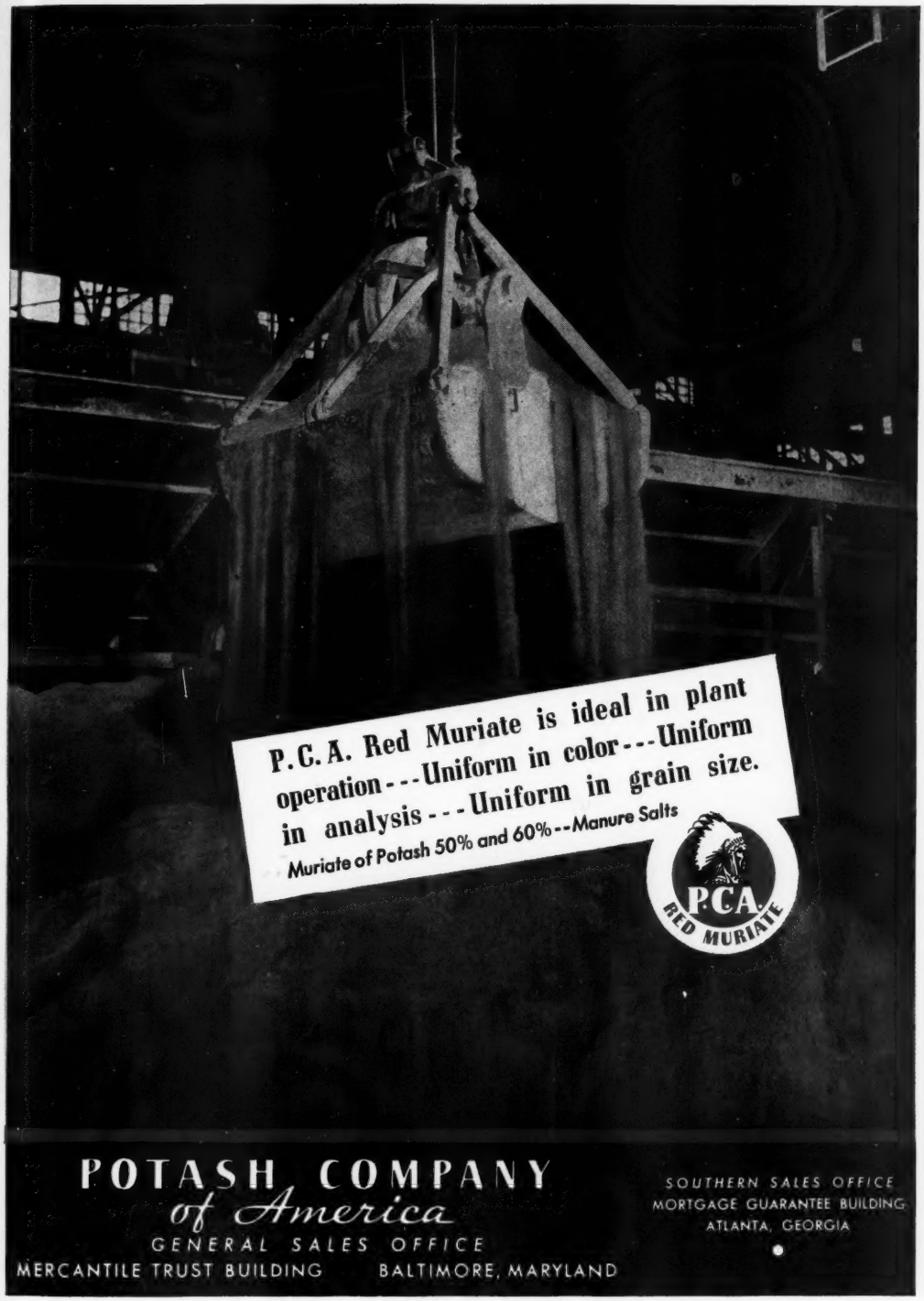
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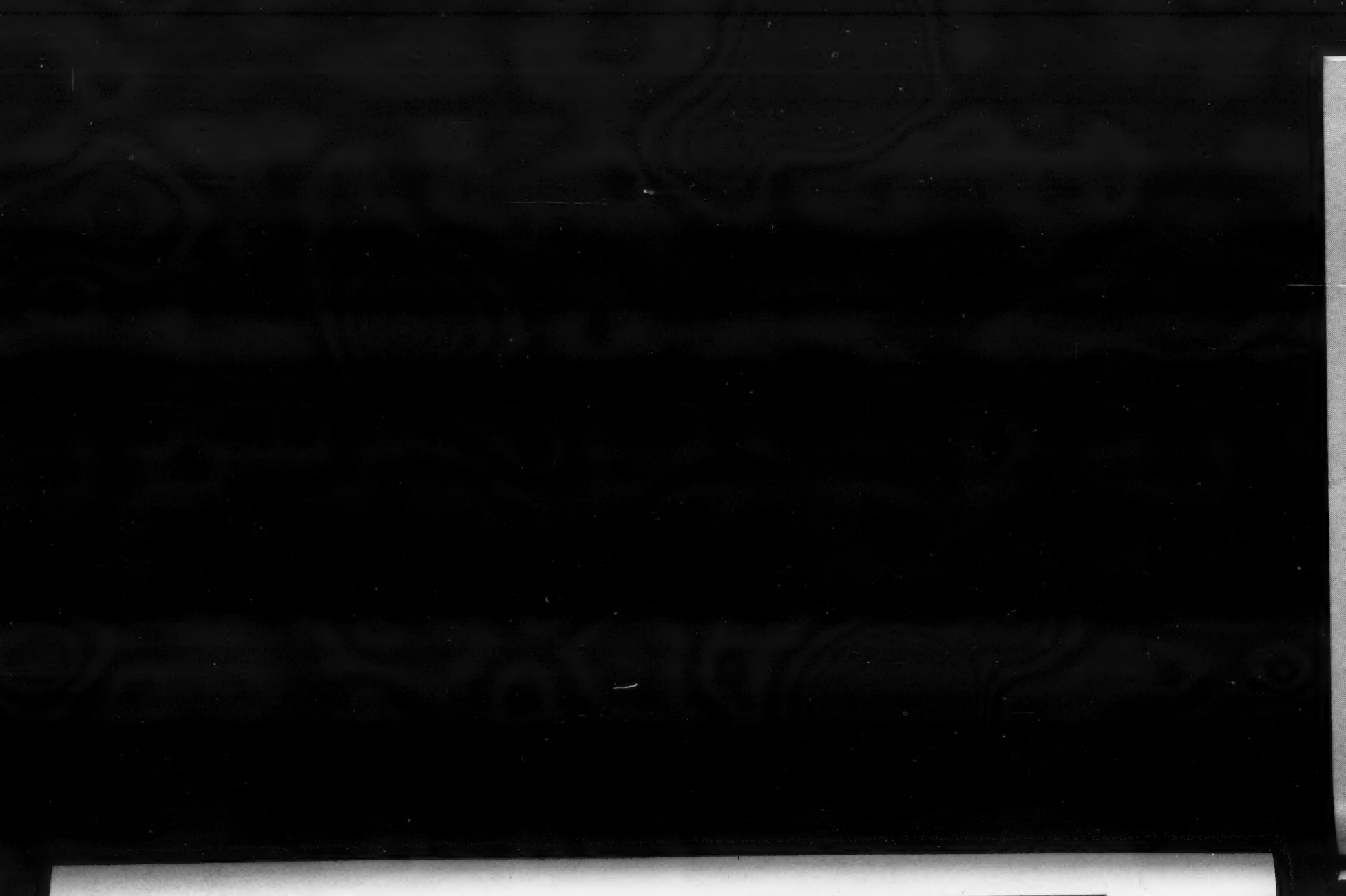
POTASH SALTS
SULPHATE of AMMONIA
NITRATE of SODA
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FISH MEAL, BONE MEAL
TANKAGE, BLOOD
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